PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to the Rolling of Zinc Based Alloys

We, CENTRE NATIONAL DE RECHERCHES METALLURGIQUES, of 47, Rue Montoyer, Brussels, Belgium, a Belgian Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is performed, to be particularly described in and by the following statement:—

The invention relates to a method for rolling zinc based alloys, more specifically an alloy containing, by weight

0.05% to 2% Cu
0.005% to 0.4% Ti

the remainder being constitued of zinc accompanied by the customary impurities, i.e. Pb, Cd, Sn, Fe, In, Ag.

It is known that one of the well known methods for the continuous casting of zinc based alloys which are intended to be submitted subsequently to a rolling operation, consists in pouring the alloy in liquid state into a tank provided with a suitable overflow, permitting the continuous pouring of the metal along a slope, where it solidifies progressively while passing through a calibrated constriction. On issuing from this constriction, the solidified metal is in the form of a continuous plate with flow dimensions varying from 10mm to 20mm in thickness and from 900mm to 1200mm in width, and the temperature of which is such that the rolling operation can immediately be carried out without the necessity for effecting reheating. A casting process of this type will hereinafter be referred to as an oblique casting process.

It is known moreover that the characteristics of the rolling process have considerable influence on the physical and mechanical properties of any particular alloy, said properties moreover being variable in accordance with the nature of the alloy concerned. Among these characteristics can be mentioned the rolling temperature, the number of passes, the degrees of thickness reduction per pass, the speed and the rolling pressure and so on.

In the case of the particular alloys mentioned above it has been found that such alloys, subjected to a rolling operation at an initial temperature between 230°C. and 270°C., and in which one pass (called the principal pass) at least, has a degree of thickness reduction between 85% and 95%, and preferably between 88% and 90%, supplies a sheet in which the breaking load is practically independent of the angle formed by the direction of rolling and the axis of the tensile test piece sampled for the purposes of determining the said breaking load.

This isotropy of the breaking load generally has a beneficial influence, since it reduces the formation of corneous areas during any subsequent stamping or sheathing. This influence is particularly marked when the alloy has been cast in accordance with the customary procedures of continuous casting, but especially in accordance with the "oblique casting" method.

To the best of the applicants' knowledge, degrees of thickness reduction of this magnitude have results of this type only for the alloys mentioned above, and lower degrees of thickness reduction already carried out on

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these alloys have only led to a clear anisotropy of the breaking load of these alloys.

Furthermore, and in accordance with an advantageous variation of the method of the invention, the rolling operation also comprises at least one pass, the degree of thickness reduction of which is between 49% and 51%, the said pass being executed preferably after the main pass, the said operation also comprising at least one reversal of the direction of rolling.

It has been confirmed in fact that with this variation it is possible while still conserving the isotropy of the breaking load, to improve considerably the bending qualities of the metal, as measured by a conventional bending test, as well as its stability for use at high temperature. This improvement is attributable to a more dense arrangement of the alignment of the precipitates of $TiZn_{15}$ in the metal. The properties indicated above are particularly important when the method of the invention is applied to an alloy in conformity with that indicated above, but for which the content of Cu is between 0.4% and 1.5%, and that of titanium is between 0.10% and 0.20%.

WHAT WE CLAIM IS:—

1. A rolling process applied to an alloy, the composition of which by weight fulfils the following conditions:

$$0.05\ \% \leqslant Cu \leqslant 2\ \%$$
$$0.005\% \leqslant Ti \leqslant 0.4\%$$

the balance being constituted of zinc accompanied by its customary impurities (Pb, Cd, Sn, Fe, In, Ag), the said alloy being at a temperature between 230°C. and 270°C. at the beginning of the rolling operation, characterised in that it comprises at least one pass, hereafter designated the main pass, having a degree of thickness reduction between 85% and 95%.

2. A method as claimed in Claim 1, in which the degree of thickness reduction of the main pass is between 80% and 90%.

3. A method as claimed in Claims 1 and 2, characterised in that the alloy has been cast in a continuous casting process.

4. A method as claimed in Claim 3, in which the alloy has been cast by a process of oblique casting.

5. A method as claimed in any of Claims 1 to 4, characterised, in that it further comprises at least one pass, the secondary degree of thickness reduction of which is between 49% and 51%.

6. A method as claimed in Claim 5, in which the said secondary pass is carried out after the main pass.

7. A method as claimed in any of Claims 1 to 6, characterised in that the rolling operation comprises at least one reversal of the rolling direction.

8. A method as claimed in any of the Claims 1 to 7, characterised in that it is applied to an alloy whose content in copper is between 0.4% and 1.5% and that of titanium is between 0.10% and 0.20%.

9. Rolled alloys obtained in accordance with a method claimed in any of the preceding claims.

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